

--	--	--	--	--	--	--	--	--	--	--	--

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

TVR3101 – VIRTUAL REALITY
(All sections / Groups)

2 JUNE 2016
9.00 a.m - 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 5 pages with 5 Questions only.
2. Attempt **FOUR** out of **FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1

1(a) List TWO main problems of Head Mounted Display (HMD) in the early 1990s compared to the current HMD. [2 marks]

1(b) Virtual Reality triangle has three components (the 3I) and is normally being used to describe what virtual reality is. List the THREE components. [1.5 marks]

1(c) The figure below shows a person playing a VR game without using any props or controller. Briefly **describe** the type of interface that is used by the user to interact with the game. [2 marks]



Figure 1: No props or controller were used to play the VR game.

1(d) As a VR expert, you have been invited to test a new VR system. When you are interacting with the VR environment, you noticed that the tracker did not give good measurement in terms of positional accuracy. You also found that there is also a copper wire nearby the place where you are standing. Name the type of tracker that might be used by the VR system and give one reason why the accuracy is poor. Then, suggest a way that you can do to improve the accuracy of the tracker. [2.5 marks]

1(e) The following VRML program uses PROTO to create a prototype of an Axis. By using the Axis PROTO, write a short VRML code to create two Axis, vertical and horizontal (as shown in Figure 2). The vertical Axis is having the exact color and size as defined in the PROTO while the horizontal Axis is having red color and rotated 90 degrees from the vertical Axis. [2 marks]

Continue...

```
1 #VRML V2.0 utf8
2 PROTO Axis [
3     field SFColor axisColor 0 1 0
4     field SFColor arrowColor 0 1 0
5 ]
6 Group {
7     children [
8         Shape {
9             appearance Appearance {
10                 material Material {
11                     diffuseColor IS axisColor
12                 }
13             }
14             geometry Cylinder {
15                 height 20 radius 0.1
16             }
17         }
18         Transform {
19             translation 0 10 0
20             children [
21                 Shape {
22                     appearance Appearance {
23                         material Material {
24                             diffuseColor IS arrowColor
25                         }
26                     }
27                     geometry Cone {
28                         height 0.3 bottomRadius 0.2
29                     }
30                 }
31             ]
32         }
33     ]
34 }
```

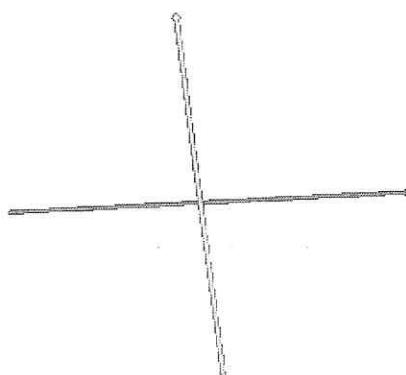


Figure 2: A vertical Axis and a horizontal Axis.

Continue...

Question 2

2(a) Inertial tracker is normally used with Ultrasonic tracker due to some weaknesses. State **one** of the weaknesses in the inertial tracker. [1 mark]

2(b) You entered a room and found that a user is interacting with the virtual world using *magnetic tracker* as shown in Figure 3. Among (a), (b), (c) and (d), state which one is the transmitter and which one is the receiver. [1 mark]

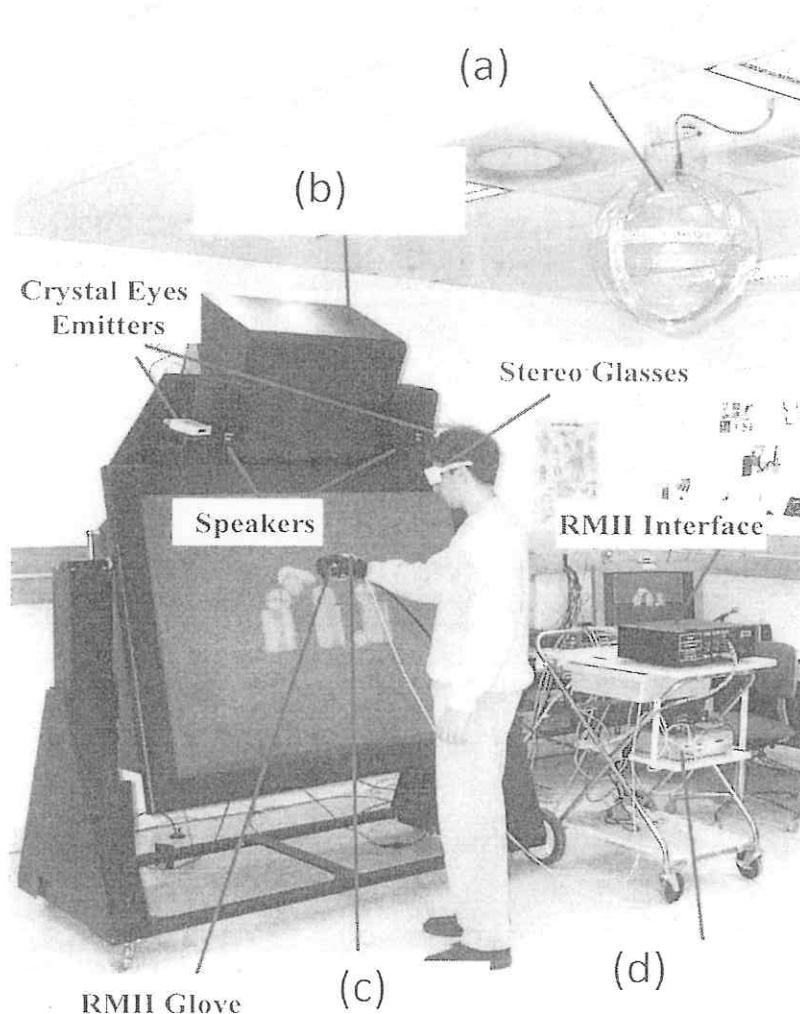


Figure 3: User interacting with the virtual world

2(c) Write the definition of a personal display and state two types of personal VR displays that you know. [2 marks]

2(d) Describe the principle technology that is used in auto-stereoscopic display to present the left and right views to the user. Then, give one difference between an active and passive auto-stereoscopic display. [2 marks]

Continue...

2(e) Describe the word *Haptic*. Then, describe touch feedback in terms of:

- the type of human sensors that it relies on
- the kind of information that the touch feedback conveys to the user
- easiness of implementation when comparing with force feedback

[4 marks]

Question 3

3(a) You attended a talk given by a sales representative of a VR company that sells Haptic feedback actuators. In his presentation he mentioned the following points:

"Our feedback actuators are safe for the user, have high bandwidth, high dynamic range, low power/weight ratio and low power/volume ratio"

As a VR expert, you think that there were something wrong with the statements. Identify the mistakes and give reasons. [2 marks]

3(b) Describe in detail the three functional stages in Graphic Rendering Pipeline (around 150 words). [6 marks]

3(c) Draw a Java3D scene graph (content branch only) for the following 3D object shown in Figure 4. [2 marks]

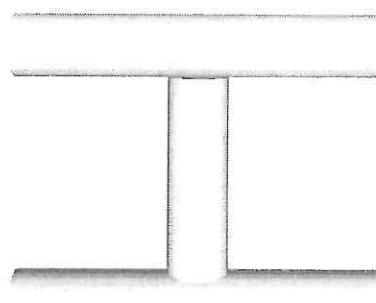


Figure 4: 3D Object

Continue...

Question 4

4(a) Suppose a virtual object has undergone the following transformations:

- translation value of $(1, 2, 1)$
- no change rotation
- no change in scale

Write the 4×4 transformation matrix that captures all the transformations.

[1 mark]

4(b) One of the simplest ways to obtain 3D models is to buy them from the internet or getting it for free when people share them. State and describe 2 other ways to obtain the 3D models.

[2 marks]

4(c) Describe the problem faced by *discrete geometry LOD* in managing the level of detail. Describe two ways to overcome the problem

[3 marks]

4(d) Define the term *wayfinding* and describe briefly three methods of wayfinding that you know.

[4 marks]

Question 5

5(a) Name four methods to select the direction that you can use when interacting with the VR environment.

[2 marks]

5(b) Describe the term *aftereffects* by explaining the following points:

- how it is induced
- duration of the effect
- giving at least two different forms

[3 marks]

5(c) Describe the three types of neural conflict that can occur to a user interacting with VR environment.

[3 marks]

5(d) A VR flight simulator is going to be opened to the public in a well-known theme park. As a VR expert, you have been consulted to advice on proper steps to be suggest.

[2 marks]

End of Page.